RoboMaster 2018 Season Plan

Competition Culture:

RoboMaster 2018 is a fully immersive real time, first person shooter, team based competition that has drawn engineers and non-engineers from across the University of Washington campus. This unique competition combines the team dynamic of an E-sport with the exceptional mechanical challenge of a robotics duel. As one of the fastest growing robotics competitions in the world, RoboMaster presents the penultimate of challenges. The RoboMaster competition not only provides unparalleled entertainment to young viewers in China and abroad but also helps foster international relations and education for the next generation of engineers.

With a team of passionate, dedicated engineers, ARUW is excited to compete in the 2018 RoboMaster Competition. Our goal this year is to be the first non-Chinese team to go to the final match of the tournament. In order to achieve this goal, we ask each member to contribute a minimum of 10 hours per week working on design and production. However, our members go above and beyond in their commitments and dedicate upwards of 40 to 50 hours a week. This is a testament to their passion for robotics as well as their commitment to excellence. Through competition, commitment and community we hope to foster relations with other North American teams and stoke the fires of the RoboMaster competition.

Project Analysis

Standard Robot (Importance: ****)

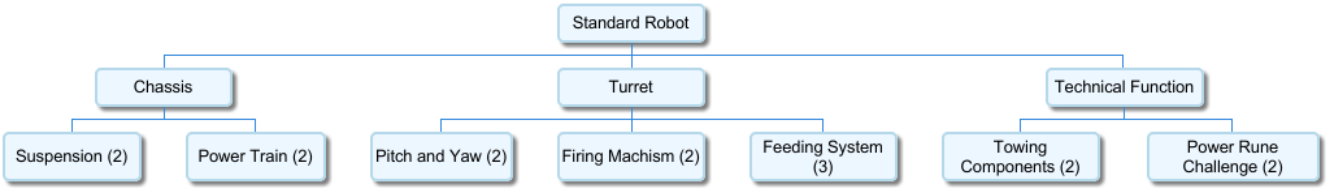
Role In Game:

- Functions as a pack of soldiers with flexible tactics including aggressive, defensive and interfering movements.

Design Requirements:

- High maneuverability
- Good terrain adaptability
- Good turret with reliable shooting and feeding system compatible with 17 mm ammo (without jamming)
- Assisting algorithm that stabilize dynamic system (PID)
- Pattern recognition/Auto aiming system

Function Composition & Personnel Diagram:



Note: The digit under each subdivision indicates the number of individuals who are assigned to the specific projects.

Manufacturing Timeline:

Date	Robot/Component(s)	Projected Status
2017/12/31	Standard Robot (Mark 1)	All components of the Standard Robot should be designed with a bill of materials sent out for manufacturing and assembly within the next week of deadline.
2018/01/15	Standard Robot (Mark I)	First version of standard robot manufactured and assembled with PID/CID/Architecture implementation and integration from EE/CSE Team beginning. Testing for improvements will also begin.
2018/01/31	Standard Robot (Mark II)	Errors and Flaws in original design should be identified, corrected, and/or improved upon by this point. Design should be finalized by this point and sent through final phases of Audit System.
2018/02/28	Standard Robot (Mark II)	More copies (at least two) of the Standard robos should be assembled.
2018/03/30	Standard Robot (Final)	Further design changes or improvements based on feedbacks from previous testing are made. Begin final round of design iteration.

Budget Planning:

Soldier Robot		
Chassis (Priority 1)	Turret (Priority 2)	Technical Functions (Priority 3)
900 USD	800 USD	600 USD

Engineering Robot (Importance: ***)

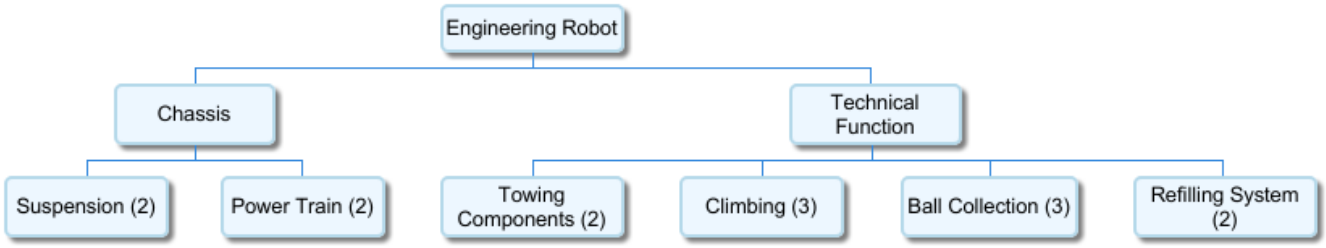
Role In Game:

- Functions as a supporting assistance that can refill, tow and heal other robots. Able to climb and collect ammo on the resource island. Able to refill the Hero with 42mm ammo. Main towing robot after completion of climbing and collection task.

Design Requirements:

- Ability to climb resource island
- Ability to collect large number of 42mm ammo
- Ability to refill Hero robot with 42mm ammo
- Assisted/auto climbing system
- Assisted/auto collection/feed system
- Ability to drop healing card
- Good towing mechanism

Function Composition & Personnel Diagram:



Note: The digit under each subdivision indicates the number of individuals who are assigned to the specific projects.

Manufacturing Timeline:

Date	Robot/Component(s)	Projected Status
2017/12/31	Chassis/Climbing/Towing/ Ball Collection Mechanism	Chassis Design should be completed; Climbing and Towing System Designs should also be nearing completion; Ball Collection Mechanism design will be assigned.
2018/01/15	Chassis/Climbing/Towing/ Ball Collection Mechanism	First three listed components should be designed; ball collection mechanism should be designed and finishing auditing system. Begin rapid prototyping and generating bill of materials
2018/01/31	Engineer Mark I	Completed robot assembled and manufactured for integration from EE/CSE Team and troubleshooting
2018/02/28	Engineer Mark II	Robot should be assembled and integrated for additional testing and quality assurance. Errors and Flaws in original design should be identified, corrected, and/or improved upon by this point. Design for final version of Standard robot should be finalized and sent through final phases of the audit system.
2018/03/30	Engineer (Final)	Further design changes or improvements based on feedbacks from previous testing are made.

Budget Planning:

Engineering Robot	
Chassis (Priority 1)	Technical Functions (Priority 2)
1100 USD	1800 USD

Hero Robot (Importance: *****)

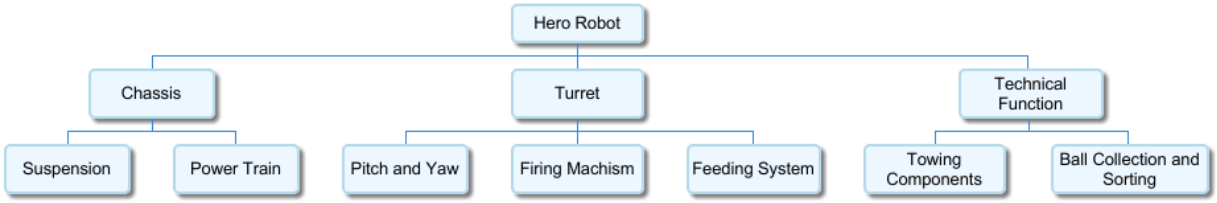
Role In Game:

- Functions as a super standard robot with aggressive tactics including collecting and shooting both 17mm and 42mm ammo.

Design Requirements:

- High maneuverability
- Good terrain adaptability
- Turrets with reliable shooting and feeding system compatible with 17 and 42mm ammo (without jamming)
- Assisting algorithm that stabilize dynamic system (PID)
- Pattern recognition/Auto aiming system
- Assisted/auto ammo collection system
- Reliable ammo sorting system

Function Composition Diagram:



Design/Manufacturing Timeline:

Date	Robot/Component(s)	Projected Status
2017/12/25	Hero Robot	Design process begins for all necessary component.
2018/01/31	Hero Robot	Designs should be nearing final stages of auditing system for manufacturing and assembly to begin
2018/02/15	Hero Robot	Designs should be done and bill of materials should be sent out. Manufacturing and assembly should begin for all components as well as integrated.
2018/03/15	Hero Robot	Robot should be completed and going through Quality assurance testing. Redesigns should be submitted and done as well.
2018/03/30	Hero Robot (Final)	Design for robot finalized, and manufactured/Assembled.

Budget Planning:

Hero Robot		
Chassis (Priority 1)	Turret (Priority 3)	Technical Functions (Priority 2)
1000 USD	800 USD	800 USD

Personnel Division:

- We haven't started on the Hero yet, but we are planning to assign a total of 13 people to work on it.

Sentinel Robot (Importance: **)

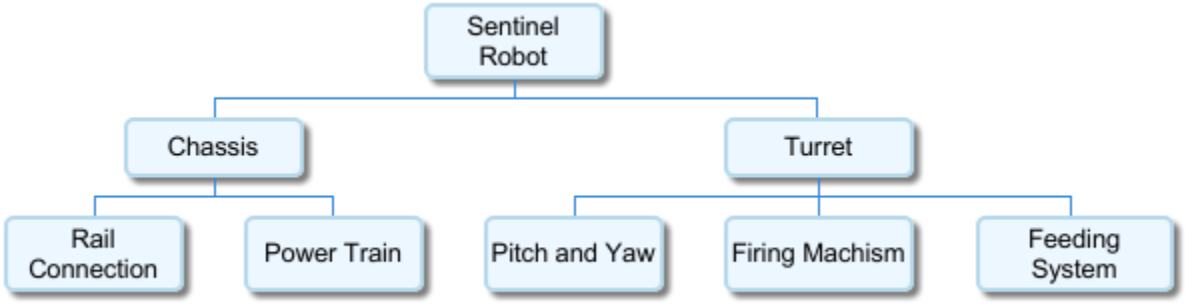
Role In Game:

- Fully autonomous defensive robot. Will protect the base from enemy robots and move in evasive patterns.

Design Requirements:

- High maneuverability and quick acceleration
- Good turret with reliable shooting and feeding system compatible with 17 mm ammo (without jamming)
- Assisting algorithm that stabilize dynamic system (PID)
- Pattern recognition/Auto aiming system
- Automation (Movement and firing)
- Threat Priority Algorithm

Function Composition Diagram:



Design/Manufacturing Timeline:

By Date	Robot/Component(s)	Projected Status
2018/12/23	Sentinel Robot	Design/research process begins for all necessary components (chassis, turret, automation)
2018/01/31	Sentinel Robot	Designs/research should be nearing final stages of auditing system for manufacturing and assembly to begin.
2018/02/15	Sentinel Robot	Designs should be done and bill of materials should be sent out. Manufacturing and assembly should begin for all components as well as integrated.
2018/03/15	Sentinel Robot	Robot should be completed and going through quality assurance testing. Redesigns should be submitted and done as well.
2018/03/30	Sentinel Robot	Design for robot finalized, and manufactured/assembled.

Budget Planning:

Sentinel Robot		
Chassis (Priority 1)	Turret (Priority 3)	Technical Functions (Priority 2)
800 USD	400 USD	500 USD

Personnel Division:

- We haven't started the sentinel yet, but we are planning to assign a total of 5 people to work on it.

Aerial Robot (Importance: ∗)

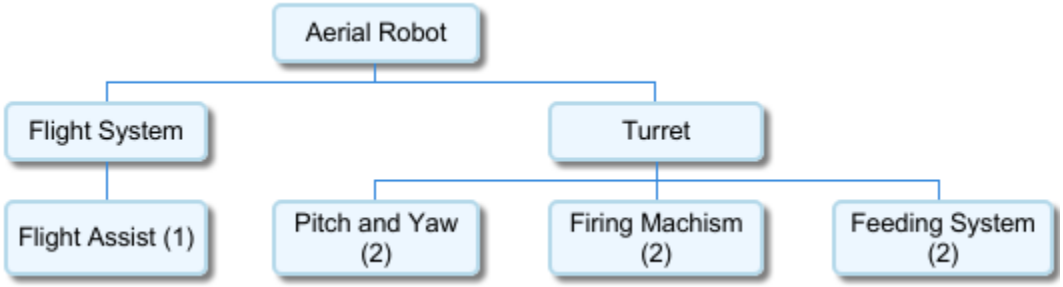
Role In Game:

- Functions as aerial support robot shooting enemies from above and should be able to function both offensively and defensively.

Design Requirements:

- Easy maneuverability
- Good turret with reliable shooting and feeding system (without jamming)
- Assisting algorithm that stabilize dynamic system (PID)
- Pattern recognition/Auto aiming system
- Flight Assist systems

Function Composition & Personnel Diagram:



Note: The digit under each subdivision indicates the number of individuals who are assigned to the specific projects.

Manufacturing Timeline:

Date	Robot/Component(s)	Projected Status
2017/12/31	Aerial Robot Components	Design/research process begins for all necessary components (flight system/turret)
2018/01/15	Aerial Robot (Mark I)	Designs/research should be nearing final stages of auditing system for manufacturing and assembly to begin
2018/01/31	Aerial Robot (Mark I)	Designs should be done and bill of materials should be sent out. Manufacturing and assembly should begin for all components.
2018/02/28	Aerial Robot (Mark II)	Mark I should be completed and being tested, as well as designs for Mark II having been finalized and sent out.
2018/03/30	Aerial Robot (Final)	Design for final robot finalized.

Budget Planning:

Aerial Robot		
Flight System (Priority 2)	Turret (Priority 1)	Technical Functions (Priority 3)
900 USD	400 USD	600 USD

Refiller (Importance: **)

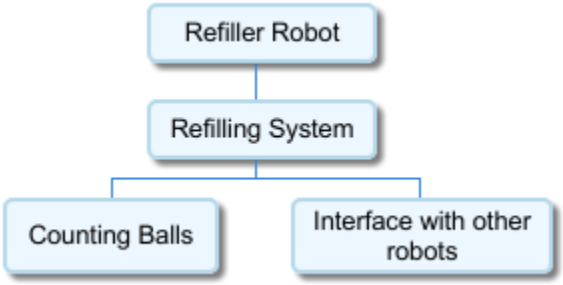
Role In Game:

- Primary function is to refill other robots with 17mm ammo.

Design Requirements:

- Ability to refill both Soldier and Hero robot
- Ability to refill multiple robots simultaneously
- Quick and Reliable filing process
- Count and refill robots with a specified number of 17mm ammo

Function Composition Diagram:



Design/Manufacturing Timeline:

By Date	Robot/Component(s)	Projected Status
2018/02/07	Refiller	Design/research process begins for all necessary components.
2018/02/31	Refiller	Designs should be finished going through auditing process and all materials required for manufacturing and assembly required will begin being purchased.
2018/03/15	Refiller	Manufacturing and assembly should be finished or finishing. Integration, Q&A and testing begin
2018/03/30	Refiller	Redesigns should be submitted for the correction of errors and/or improvements.
2018/04/15	Refiller	Final design components manufactured and assembled.

Budget Planning:

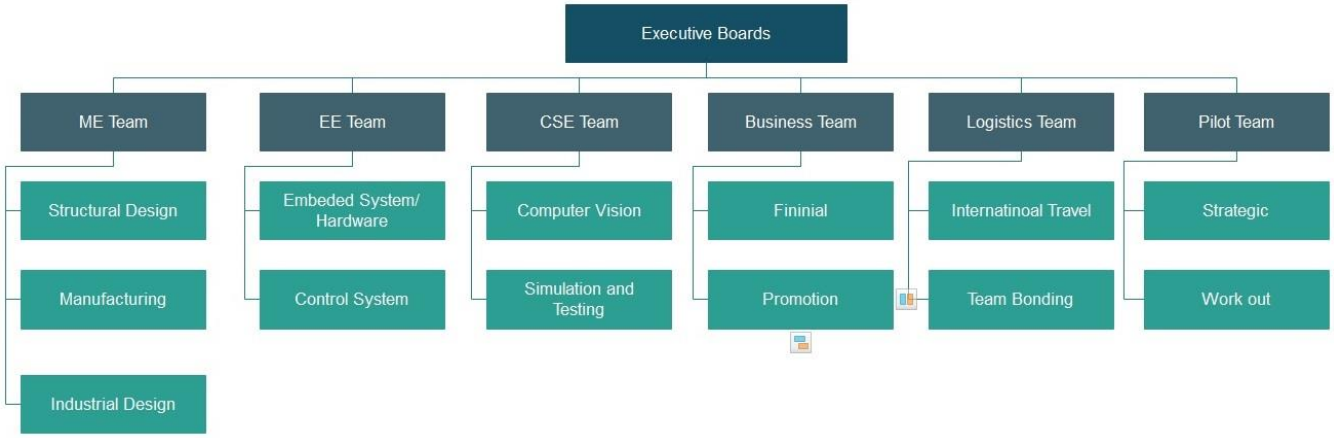
Refiller Robot	
Structural Components (Priority 1)	Technical Functions (Priority 2)
300 USD	800 USD

Personnel Division:

- We haven't started the refiller yet, but we are planning to assign a total of 3 people to work on it.

Team Structure & Organization

Team Structure



Personnel Structure

Note: The digit under each subdivision indicates the number of individuals who are in the corresponding year grade.

Recruiting Direction

- UW College of Engineering
    - Department of Mechanical Engineering
    - Department of Electrical Engineering
    - Paul G. Allen School of Computer Science Engineering
    - Department of Civil and Environmental Engineering
    - Department of Aeronautics and Astronautics
    - Department of Industrial and System Engineering
    - Department of Human Centered Design Engineering

- Other UW Departments
    - Michael G. Foster School of Business
    - Department of Political Science
    - Department of Mathematics

- Department of Biology
- Department of Art, Art History and Design
- Department of Architecture
- Department of Economics
- Department of Physics

Responsibility Clarification

Executive Board

The executive board is made up of the President, Vice-President, Project Manager, and Team Leads. The goal of the executive board is to organize, plan, and carry out key decisions in helping the team complete the robots, gather the support, and create a wonderful experience for the engineers.

ME Team

Our ME team makes up the core of our robots. The ME team is responsible for designing robot physical structures using CAD software such as SolidWorks, generate bill of materials and components, manufacture robot components using machines such as 3D printer, laser cutter, milling machine, lathe machine, grinder and water jet machine, etc. and lastly assemble, repair and improve the robots.

EE/CSE Team

The EE/CSE team's primary purpose of the team is to add the "brain and nervous system" to our robots, this includes critical hardware components such as power regulation and distribution all the way to advanced software like tracking algorithms with predictive filtering in chaotic systems and PID theory. The EE/CSE team works closely with the ME team throughout the design process to ensure smooth integration of electronics.

Business Team

The business team is primarily responsible for fostering sponsor relations, item acquisition, team budget, and our website management. The business team works closely with our engineering teams in order to provide the proper support our team's needs, especially when it comes to our building materials.

Logistic Team

Planning, managing, and sending many engineers and robots to China proves a difficult task. Our logistics team is responsible for

Pilot Team

The individuals in our pilot team are an intelligent and dedicated group of engineering students who are required to participate in weekly practice sessions oriented towards strategy and teamplay, as well participate in team-building exercises outside of these practice sessions to hone both their mechanical ability with the robot and their synergy as teammates. They are also required to participate in strategy meetings, wherein each member is required to have a proficient knowledge of the game rules, as well as robot design and function.

Knowledge Sharing

Online Team Sharing System

Most of our team's communications occur over Slack, a team communication app, with some select conversations between the executive board and supporting members happening over Facebook messenger.

Most subteams have a specialized Slack channel with some having a second channel devoted to posting additional resources that team members can use to further their knowledge. Team commitment is also measured in part by the amount of involvement that each member gives to participating in communications. Slack is connected with Trello to encourage awareness of upcoming deadlines and establish a complete timeline of projects that need to be completed and teams that need to coordinate their efforts.

Files that are for temporary sharing are attached on Slack, while documents that will need to be referred back to throughout the year are kept in a team wide Google Drive that most teams have a separate folder within. We also store administrative files on the Google Drive.

We also use two different versions of control systems, Perforce and Gitlab. The mechanical team uses Perforce to track the editing history of CAD files whereas the computer science and electrical engineering teams store their repositories on Gitlab where the code from previous years resides. There is a separate project for different section of the code so the right people have editing privileges while everyone can view the changes made.

Online Forum With Open Source Materials

Our Chinese speaking members have been looking through and asking questions on the Chinese RoboMaster forum. The forum has been very helpful in gaining rule clarifications as well as providing resources such as a CAD models of the resource island which we printed out. In addition to the Chinese forum, a couple members have been working on creating an English forum on Reddit so that all the North American teams can have a similar resource.

DJI Product Supply Manuals

Regarding all the products from DJI, we have found that they are all well documented in the reference manuals.

Training Plan

This year we introduced training workshops to help new members gain the skills and knowledge necessary to maximize efficiency as well as invest in younger members for the future success of the club. Our hope was to spend the first third of the school year teaching less experienced members enough so that they would be more valuable members during the rest of the year and future years to come.

For the mechanical team, our training plan included tutorials on SolidWorks for CAD modelling as well as lectures on prototyping methods such as 3D printing and laser cutting. Many of the SolidWorks tutorials were based on the materials taught in the SolidWorks course at UW.

For the CSE/EE teams we held numerous workshops on varying topics. Our training program was broken down based on which subteam the members wanted to be a part of. We held two general curriculums for the entire team: one focuses on the fundamentals of circuit analysis and the other was a brief introduction to robotics (e.g. ROS, microcontrollers, serial and parallel communications, PID theory, and computer vision). Each subteam had projects that would build off the knowledge accrued by members as they attended workshops to reinforce the knowledge they learned.

Independent Training Progress

After the initial stages of training, more time was focused on the robots and those members that still have more to learn are put on the independent training program. This is because training newer members requires a lot of time commitment from more experienced members. In order to make more progress on the robots, members who are still learning are instructed to progress training on their own time. Each of the engineering teams created a curriculum that included a set of skill requirements, tutorials and learning resources. In this way members may continue to build individual skills while robot progress continues.

Audit System

Project Proposal

For an ARUW engineer to submit a project proposal, they must first submit a bill of functions. This is a document that shows the design restrictions and bill of functions of the robot/components. They often consult peers and leadership on design intent of their robot when considering the functions that their robot must perform. After submission of the proposal, the technical leads, the project manager and president of the team review the proposal. If they find the proposal wanting, they will suggest edits or ask that the member check the rules again. A timeline of the project must be submitted during this time.

Project Assignment

Projects are assigned by those that review the proposal and are distributed according to team needs and merit. Any projects that are assigned to a team or individual can be called into question by the executive board for any reason and thus put under review. Most project leads will be veteran members unless aptitude and enthusiasm is shown by a newer member.

Design Review

As projects progress, there are many milestones that must be completed. The first design review is to observe initial sketches of robots. This is where engineers take the bill of functions and draw out systems and structures to support those functions. This is often done on paper and is informal.

The next milestone is to go through a first CAD review. Technical leads review the initial CAD design and suggest edits for clarity, as well as good engineering practices. These engineering practices include the integration of electrical components with mechanical and structural components. During this time, projects are also scrutinized for validity in their approach. If design for any system seems too ambitious, projects may be reevaluated and reassigned.

The final step of design review is to submit a bill of materials, a CAD model, and diagrams detailing the system architecture of the robot. During this time, executive board members may also ask for comprehensive analysis of code and algorithm usage in the robot.

Design Verification

The design is finally verified by a full review by the executive board. They check for CAD completion, algorithm and code cohesion, overall design efficiency, and logical system architecture. The final verification is given by the president of the team. From there, funds are allocated and production can begin. Teams are given 3 weeks to complete full robot production.

Track of Progress

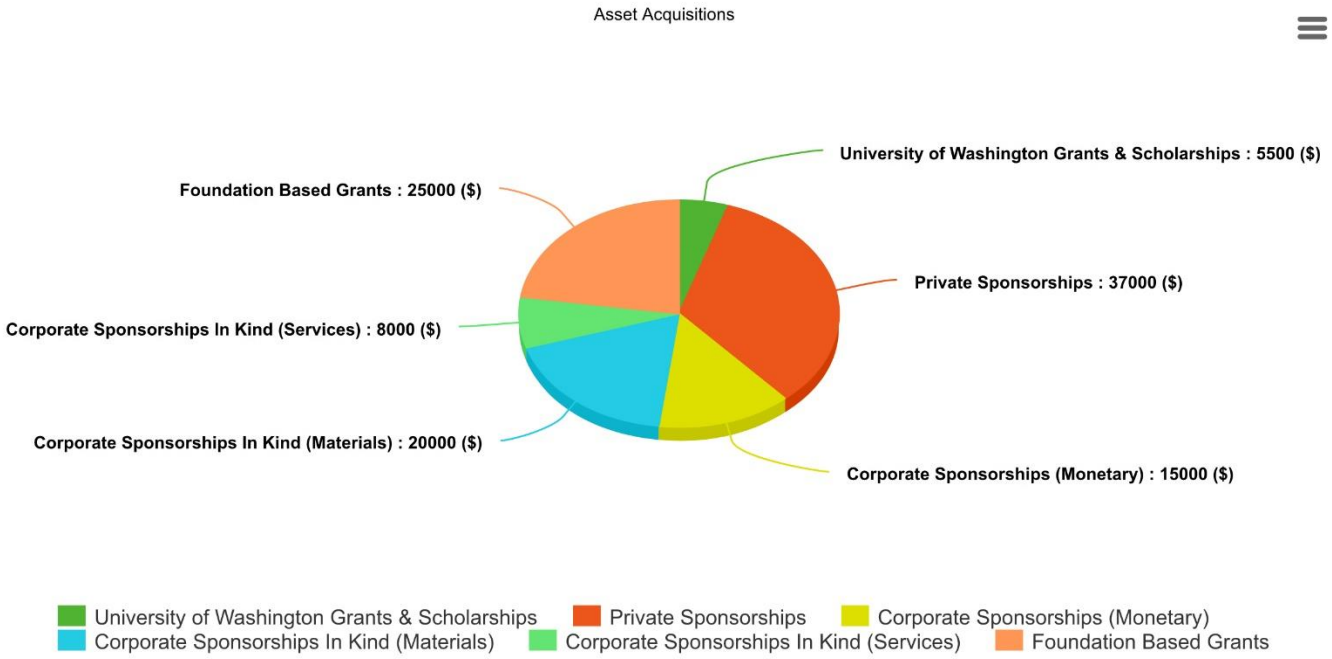
All project leads are required to file weekly progress reports detailing their current position in regards to project completeness and actions being taken into consideration for improving and continuing their work to their project manager. The project manager also utilizes various organizational tools to maintain and share a transparent timeline for each project, and uses information from these reports to shift timetables accordingly. Deadlines and progress are also discussed at General and Lead Meetings to ensure that every member is aware of how close each project is to completion as well as to promote a culture of proactivity.

Result Acceptance

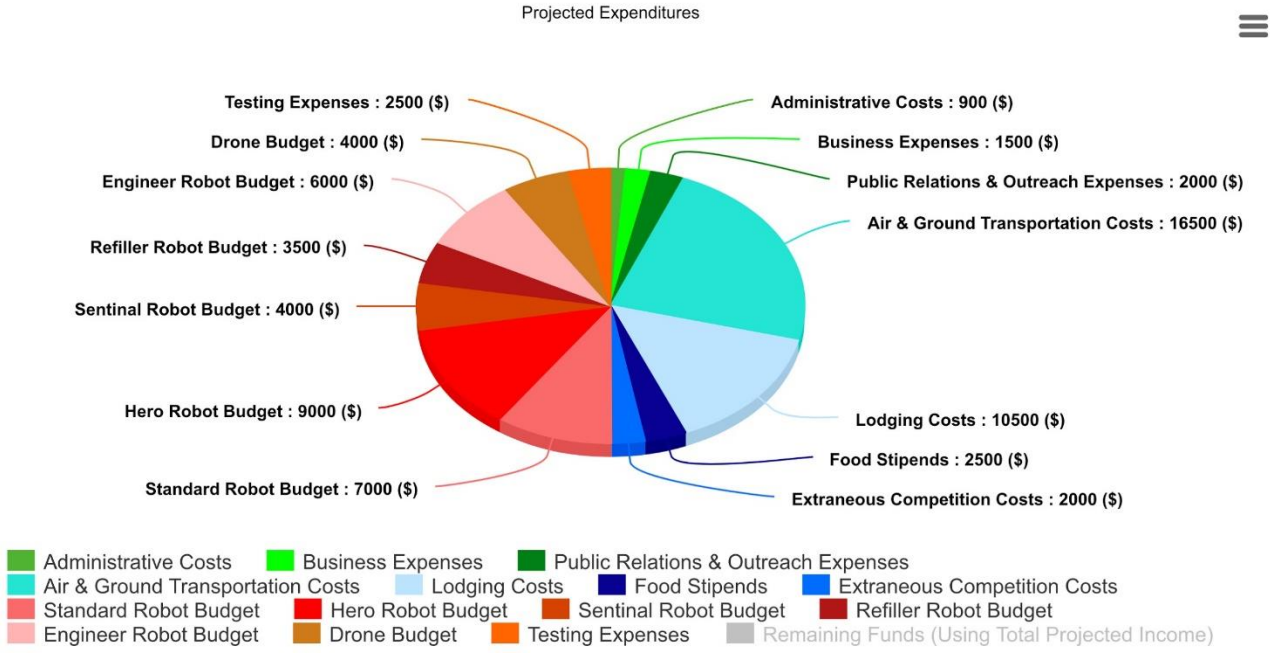
After a robot has been completed to the liking of a team lead, it is submitted to the executive board for final review. The lead demonstrates how the robot functions and interacts with other robots. They also show that pilots can easily maneuver and utilize the robot. During this time, the board may suggest final edits and redesigns to the lead that do not change the overall nature of the robot. After the produced results are accepted, the robot is duplicated if necessary and pilots begin training on the new robot.

Resource Management

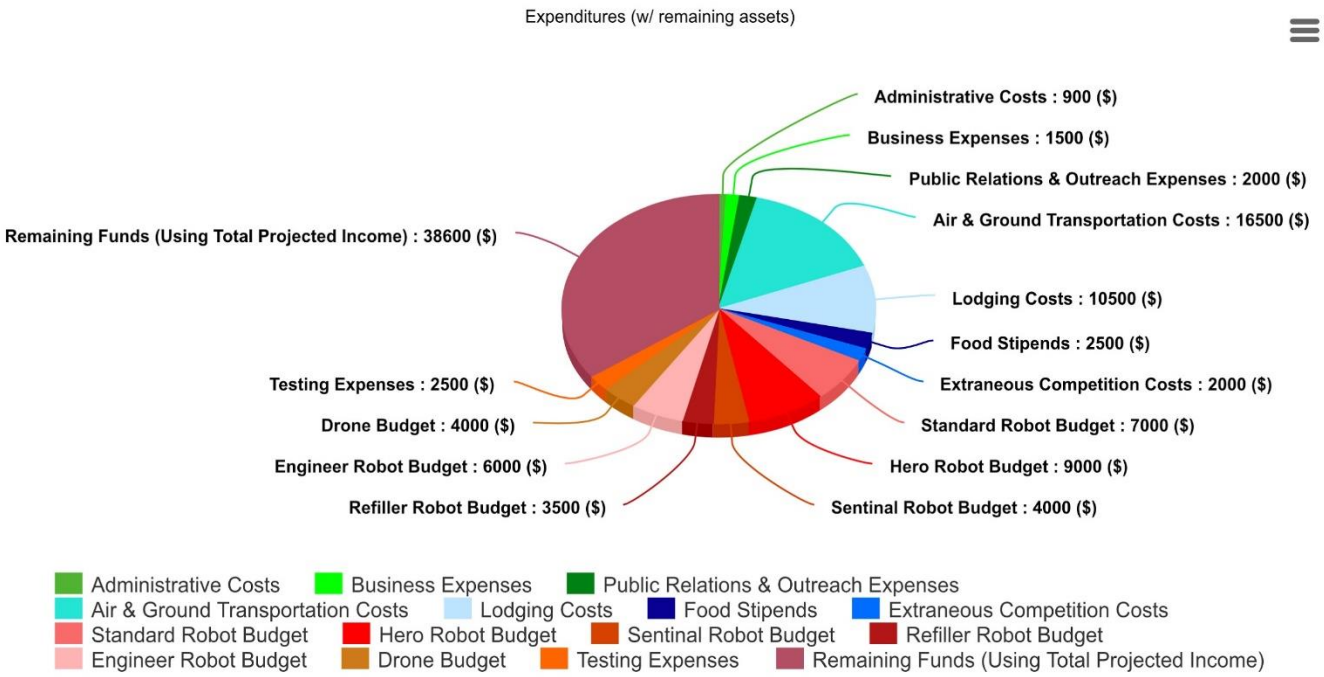
Budget Analysis & Breakdown



Using a multi-front strategy for fundraising, we plan to raise considerable capital throughout the year. Each Source of income will provide roughly ⅓ of our total annual budget (private donors, corporations, and philanthropic foundations). These projections are firstly based on a reasonably calculated income from private sponsorships. Considering that many philanthropic foundations will match private donations to educational organizations, we reason that we can confidently make the projection for the other third of our budget. Corporate donors make the final portion of our budget. This income is likely the most unpredictable and entirely reliant on Stage Two of our Business Plan as explained in the next section.



The majority of our expenses (approx. 52.2%) will be the necessary and desired costs for the development of our robots. This is a significant increase from our robot expenditures during for the 2017 competition. This increase reflects our ambition for this year's competition and our new confidence in finding supports. Being a United States based team, approximately 37.4% of our projected expenditures will be spent on the competition itself. While the budget for each robot can be cut and adjusted, the costs of the competition will likely hold steady. This presents an incredible challenge to our Business and Logistics teams. Fortunately, these expenses have the potential to be covered privately by our individual members.



Fortunately, our projected income for the year significantly over steps our possible expenditures. If this extra capital were to exist as we approach the middle of Stage Three of the Business Plan (mid May), it would likely be spent on building spare robots for the competition or on projects that would act as investments for future competitive seasons. However, this extra capital cannot be expected, even if it is projected to exist. As we enter Stage Two of the Business Plan (see below), these projections will become more refined and the success of each program will help to determine our overall success at the 2018 RoboMaster Competition.

Material & Manufacturing Resources Procurement

The majority of our materials are purchased, with the exception of a few material sponsorships. We are fortunate to have local suppliers of metals, plastics, and hardware for mechanical construction. However, we do have not yet found a local reliable supplier of electronic components and order most electronic components online. Once we have developed our manufacturing plan and parts lists, our Business Team will work with our sponsors and other potential sponsors to acquire some of the parts needed. While it is easy for us to purchase parts online, it is cheaper both for us and for our corporate sponsors to attain material sponsorships as opposed to cash sponsorships. Through this approach, it is likely that we will be able to acquire more sponsorships and therefore more of our desired materials. However, it is important to note that not all of our material needs/desires will be met. In such case, we may have to adjust our designs to account for a shortage of funds or a failed sponsorship.

As an interdisciplinary robotics team, we can take advantage of many of the resources that the University of Washington has available. There is the mechanical machine shop, Area01 Dabble Lab, and the Commotion makerspace on campus for machining and prototyping. The machine shop has lathes, a variety of CNC machines, a welding room, a waterjet machine, as well as many smaller machines. It is a very capable shop focused on custom manufacturing for student projects

such as manufacturing parts for this team. The machine shop also employs a few full-time shop masters that are extremely experienced in manufacturing and are able to assist students in the machining process. The other labs on campus are well suited to prototyping, as they are full of 3D printers, laser cutters and electronics workstations.

Human Power Arrangement

Before acceptance to the team, we ensure members that we require a minimum of 10 hours of work per week be committed to the team. By holding several meetings of varying scope each week, we are able to efficiently manage and hold accountability for our members. Our general meetings for all members are held on Saturdays where we have team wide announcements and each team presents a current progress update.

During the week members will also attend sub-team meetings where they will meet with in their project groups to coordinate weekly tasks. Finally, members are also required to set a two-hour work block when they will come in to lab and work on their projects individually or in pairs. The idea of work blocks is to help members with their individual time management and ensure they set aside time weekly to work on their tasks for this club. This tiered meeting system is an effective way to insure time requirements are met and to keep all members informed of the whole team progress.

Schoolwork & Club Project Balance

Balancing school, work, and robotics is a challenging task. However, our team provides our members the support they need to be successful in both. With streamlined work flow, and clear-cut projects, each member is assigned work that suits their skill level and expertise. For newer members, we have “learning projects” in which they can develop their skills as engineers. For the more experienced members, they are split up into sub teams where the team lead is responsible for holding them accountable for the work they produce and complete. We try to follow a work schedule that our executive board created before school started, so we all adhere to proper deadlines and get our work completed in a high quality and efficient manner.

Business Planning

ARUW RoboMaster 2018 Business Plan

Stage One (September 2017 - December 2017)

Stage One goals include but are not limited to the following items: acquiring and securing University of Washington based work spaces and access to manufacturing resources, building sponsorship proposals, sending out Thank-You-Packages to 2017 sponsors, preliminary fundraising through crowd-funding, and establish connections with University of Washington fundraising resources as well as with local companies that can provide valuable resources.

Since Seattle is a space constrained city and the University of Washington is a space constrained campus, it is imperative to make acquiring a space to work a top priority. Other competitive engineering organizations at the University of Washington have found it difficult to maintain work spaces that are large enough to accommodate the needs of the organization. ARUW is fortunate to have had a large space in 2017, therefore, it will be easy enough to apply for a maintained occupation of the space for the 2018 competitive season.

Building sponsorship proposals will be critical to the success of our stage two plan and all future sponsorship efforts. This is where we will create & present our goals as a team. We will define our relationships to businesses who want to sponsor us and communicate what we can do for each of our sponsors. Since we did not have sponsorship proposals for the 2017 competitive season, the new sponsorship proposal will help guide us as we thank our previous sponsors and as we set up our crowdfunding efforts. In that light, we will be using the US based ‘nonprofit’ resource for crowdfunding called USEED. Based on our projected fundraising capacities, we plan to raise between $25,000 and $50,000 between November 19th and January 4th. This will allow us a large initial pot to start the manufacturing of our robots during the second

academic quarter of the year. Additionally, all remaining funds in late February will be put towards purchasing airline tickets and accommodations in Shenzhen. This will have a projected cost of $27,000 for the 2018 competition.

To prepare for fundraising efforts in Stage Two, we will begin establishing relationships with select companies and the University of Washington's fundraising resources. In particular, we will be making contact with PERFORCE, MakerBot, Microsoft, Boeing, Amazon, Dassault Systemes (SolidWorks), DigiKey, and others.

Stage Two (January 2018 - March 2018)

Stage Two of the ARUW Business Plan is focused primarily on aggressive fundraising and sponsorship. This will also be the time that our Logistics Team will be doing most of the purchases for the trip to the competition. That includes, air transportation for both the robots and our personnel, accommodations, food, and local transportation. It will be the goal of the Business Team to provide the funds necessary for the Logistics team to accomplish their goals as well as provide the resources necessary to build each robot. We will be working through the University of Washington's primary sponsor, Alaska Airlines, to reach out to Korean Air and Hainan Airlines. Both can provide flights to Hong Kong and may be able to extend the sponsorship of the University to ARUW. Additionally, we will work with US based Marriott and German based Kempinski Hotels to set up accomodations for the team in Shenzhen. Through these efforts we hope to bring down the total cost of the trip from the current projection of $27,000.

To provide the resources necessary for building each robot, our Business Team will be working with the companies listed in Stage One, and others, to provide both material and cash sponsorships. We already have potential donations from MakerBot, DigiKey, and Misumi. Other target companies are MatterHackers, NVidia, and members of the Association of Washington Businesses. Material sponsorships from the above companies would benefit ARUW tremendously but would also provide each a unique opportunity to display their products in a foreign market. As the engineering teams within ARUW need specific materials, the Business Team will pursue specific, targeted sponsorship opportunities to provide materials with low costs to the company providing the product.

To accomplish the above tasks, the ARUW Business Team & Executive Board will be carrying out a second round of recruitment to fill some new needs and to flush out some existing teams. In particular, the Executive Board will create a new Public Relations and Outreach team. The purpose of this entity will be to create informative advertising materials and to raise awareness for the team in both the University of Washington and Seattle Communities. This will allow for greater ease when pursuing sponsorships. Additionally, this will help to achieve ARUW's secondary goal which is to expand robotics based education. Within the PRO team, there will also be a subteam which will focus on event planning. This function will become critical in Stage Three.

Finally, early in Stage Two, the Business Team will recruit an optimal five more members. These individuals will be integrated into the official finance sector of the team and will also help support the fundraising efforts throughout Stage Two. The fundraising goal of Stage Two will minimize at the top end of Stage One, with a number of $50,000 in either liquid assets or donated materials. Among those who will be recruited, some members will be those who specialize in grant writing. With that we hope to gain some funds via grants from entities like the Bill & Melinda Gates Foundation, the Allen Foundation, and the Bezos Family Foundation.

Stage Three (April 2018 - July 2018)

Stage Three will be a period of much less aggressive sponsorship efforts. Of course, if the end of Stage Two leaves ARUW with debts, it will be imperative to settle those. However, there should be few future costs that will need to be accounted for. The PRO team will continue outreach, and the Business team will continue some fundraising efforts. However, most assets that would come from this period would be put towards funding the 2019 Competitive Season. The exception would be acquiring funds to put towards lowering the financial burden of the competition on our members. In

particular, if it is economically feasible, we would like to provide each member of our China Expeditionary Group a stipend to help pay for food.

To clarify, sponsorship efforts will not be a low priority during this period. While it will be important to provide liquid assets for the 2019 Competition, it is also important to satisfy some of the requirements mandate by the University of Washington. Fortunately, some of those requirements can be filled simultaneously with sponsorship efforts. As an example, the PRO team will be working through Stage Two and Stage Three to set up several events at the University of Washington and in the surrounding community to both promote ARUW and to raise money. One of those events will include a 'reveal' event. That is, we will gather University Associates, sponsors and potential donors to participate in an event we will reveal our robots for the 2018 competition to the public. When other engineering teams at the University of Washington have done events like this, they have been quite successful.

Stage Three will conclude our 2018 Business Plan. While it may not be specific, it will act as a basic guideline for ARUW to attain the resources required to participate in the 2018 RoboMaster Competition.